sincerity cannot fail to be inspiring to anyone who will be at pains to understand it. It would be a mistake to criticise the earlier half of the book as if it were a treatise on the cubic surface; it is the author's assembling of his materials for the constructions which follow, and the very want of elaboration which it occasionally exhibits is a proof, if an incidental one, of the independence with which the author has carried out his research. Perhaps the analytical investigation of the double-six theorem, which occupies pp. 16 to 19, is an extreme case; a geometrical proof might have been given, though the author's is simple and self-contained.

The book is accompanied by reproductions of elaborate diagrams, carefully drawn to scale. They would have been more interesting if not so much reduced in size. There is a long bibliography of the general literature in regard to the cubic surface, which is likely to be useful. Under 1902 there should certainly be the entry, "Beziehungen der allgemeinen Flache dritter Ordnung zu einer covarienten Flache dritter Classe," by Th. Reye, *Math. Annalen*, Bd. lv. Also the paper of G. Kohn, "Ueber einige Eigenschaften der allgemeinen Flache dritter Ordnung," *Wiener Sitzungsberichte,* Bd. cxvii., p. 66, should be referred to, and a recent paper by Prof. W. Burnside in the Camb. Phil. Proceedings, on double-sixes with projective transformations.

Medizinisch-chemisches Laboratoriums-Hilfsbuch. By Dr. Ludwig Pincussohn. Pp. xi+443. (Leipzig: F. C. W. Vogel, 1912.) Price 13.50 marks.

ONE cannot say that Dr. Pincussohn's book fulfils any real need, seeing that laboratory guides of the same nature are already numerous. The author was formerly assistant to Prof. Albderhalden, and is well known as an original worker in the field of physiological chemistry. The book he has produced is a very good one, and is specially useful because of the tables of physical and chemical data which occupy its last hundred pages. The introductory chapters deal with general chemical methods, and the remainder, as the title indicates, with that portion of the science which it is the fashion to call bio-chemistry. The analytical and other methods of research selected are up-to-date, and are described in a clear and interesting way. W. D. H.

Books that Count. A Dictionary of Standard Books. Edited by W. Forbes Gray. Pp. xx+315+lviii. (London: A. and C. Black, 1912.) Price 5*s*. net.

OF the fourteen sections into which this dictionary is divided, one deals with science, and some others are concerned with such kindred subjects as education, geography and travel, philosophy and sociology. The sections are necessarily incomplete, for the editor intends his lists chiefly for the use of young students and ordinary readers. The work should, however, be very valuable for reference to notable books in many departments of knowledge.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. *No notice is taken of anonymous communications.]*

Luminous Halos surrounding Shadows of Heads.

THE phenomenon referred to in a note in NATURE of December 12 (p. 419), as observed in rice-fields of Japan, can also be seen on grass when the sun is low in the sky. The presence of dew, I believe, increases the intensity of the halo, but it is perfectly distinct also on dry grass.

If the grass surface is near to the observer, a faint halo is seen to surround the shadow of his head, and this is more easily perceived if he is moving than if standing still; my attention was indeed first attracted to the phenomenon when bicycling.

In this mountain region I have frequently seen the halo projected on a grassy slope a mile or more distant, and under these conditions it appears as a circular or elliptical patch of light without the central shadow, the diminution of intensity due to the penumbral shadow of one's head being, of course, quite inappreciable at such distances. It is difficult to determine the size or shape of this patch, owing to irregularities in the brightness of the background; but I have been able to compare it with the nearly full moon rising immediately above it, and should judge it to be at least 2° in diameter, and probably elliptical in shape with the long axis vertical. The light appears to emanate from the grass itself, which apparently reflects more light in the direction of incidence than in other directions; it is certainly not due to dust or haze in the intermediate column of air. I am unable to say whether a smooth rock surface would give the same appearance, but a dense white cloud certainly does so, with the addition of a faintly coloured ring surrounding the white patch. This I presume is allied to the "Brocken spectre," seen when the illuminated cloud or fog is near to the observer.

The analogy of this elliptical bright patch opposite the sun with the Gegenschein is so striking that one cannot help believing both to be due to the same cause, and that matter outside the earth's orbit and beyond the limits of the earth's shadow reflects more sunlight in the direction of incidence than in other directions. That the Gegenschein usually covers a much larger angular area than the 2° patch seen on these hills may be accounted for by the much more favourable conditions in which it is seen, with a dark and uniform sky-background. J. EVERSHED.

Kodaikanal Observatory, South India,
January 4.

EXACTLY a month ago to-day, in the Betul district, Central Provinces, I had set out on field work at dawn, with my colleague, Mr. H. Walker, and two chaprasis (Indian servants). I happened to be watching our shadows as we passed along the edge of a field of young green wheat, when, to my surprise, I noticed a halo of light round the shadow of my own head and neck. Looking at the other shadows, I was still more surprised to see that only my shadow was invested with this halo. I directed the attention of Mr. Walker and the chaprasis to the phenomenon, and found that each could see a halo round his own head only. Whilst we were investigating the matter our camp passed on the march, and inquiries made both from our servants and from local people showed

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that none of them had previously noticed the phenomenon.

The conditions were obviously special, although frequently obtainable to one who deliberately set out with the purpose of finding them. The sun was at a low altitude on our left, and the wheat was soaking wet with dew on our right. The dew speedily dries up in the morning sun, and although I have kept on the look-out for this phenomenon during the past month I have never happened to pass a wheat-field again with the conditions of time, situation, and wetness repeated.

I had, therefore, intended writing to Nature to inquire whether the occurrence of these halos had been previously recorded, and consequently was greatly interested to read the note on p. 419 of your journal (December 12, 1912) concerning *Inada no goko*, or halo in the ricefield. I have not seen the Japanese journal referred to, and consequently am not aware if Profs. Fuchino and Izu direct attention to the fact noted above, that each observer sees the halo round his own head only. This fact indicates that the observer perceives those elements of a narrow cylinder of the sun's rays enclosing his head that happen to be reflected back to his eyes by the dew-drops and wheat blades; the major portion of the cylinder of light is reflected back along the cylinder, and consequently a given observer is not in the line of vision for the halo round another observer's head. The explanation advanced by the Japanese observers that the halo "is caused by the reflected light from the sun-images formed on the green blades by the passage of the sun's rays obliquely through the dew-drops" is doubtless correct. I presume that their investigations show that the farther a drop is from the edge of the shadow of the head the smaller is the proportion of the light reflected from the sun-images that can reach the observer's eye; for the boundary of the halo is not sharp, the brightness diminishing somewhat gradually with distance from the shadow. Assigning to the head in the shadow the actual diameter of the head, I estimated the noticeably bright part of the halo as roughly 10 in. wide all round the head, dying out on the shoulders.

A close inspection of the green blades showed that at or near the tip of each blade was one pearl of dew, whilst the whole of the remainder of the blade was coated with a film of minute dewdrops. It is the minute drops that give rise to the major portion of the effect.

The fact that each observer sees only his own halo obviously precludes this phenomenon from having been the origin of the halos recorded in sacred writings round the head of Christ and others.

L. L. Fermor.

Geological Survey of India, Camp, Korea State,
Central Provinces, January 4.

Procryptic Coloration a Protection against Lions.

There has been some interesting correspondence in recent numbers of *The Field* on the question of the procryptic coloration of big game, some writers taking one side and some another in the controversy. Now although there is a certain amount of evidence, scattered through sporting literature, showing that some species of African antelopes and zebras are hard for human beings to detect in particular surroundings, there is, so far as I am aware, scarcely any testimony, based upon observation in the jungle, to prove that the sight of predatory carnivora is baffled in the same way by colour assimilation.

This question has such an important bearing on the theory of the evolution, through natural selection, of obliterative coloration that I venture to repeat the following story, told by Mr. F. C. Selous (*The Field*, January 18, p. 141), which I hold to be one of the most valuable contributions to the subject ever published, and worthy, as such, of being made known to a much wider circle of zoologists than is comprised by readers of *The Field*. Mr. Selous says:—

"I once wounded one [a lion]—a very savage lion, I think—which at once came round to look for me. I was sitting on the side of a large ant-heap, and no doubt my bare sunburnt arms and legs, and the dirty old shirt and towel in which I was dressed, assimilated well with the colour of my surroundings, for although the lion came and looked straight at me, he could not make me out. I had not had time to reload my single-barrelled rifle, but had a cartridge in my right hand ready to slip into the open chamber if the lion charged. But when he came towards me and then stood looking at me, I did not make the slightest movement, and he could not make me out, and presently turned and looked the other way. . . . I am perfectly certain that had I made the slightest movement . . . this lion would have charged."

Mr. Selous is a staunch opponent of the theory of the survival value of obliterative coloration in big game, and his experience, above recounted, gains force from the fact that it was described in an article in which he was combating the double claim that the equine and most of the ruminant mammals of Africa are procryptically coloured and are benefited thereby. But we shall probably have to wait many years before we get a more cogent piece of evidence in favour of the value to antelopes and other game of a combination of assimilative patterns with stillness.

R. I. Pocock.

Zoological Society.

Animal Coloration.

An article by Dr. Francis Ward, illustrated by the author's excellent photographs, appeared in the December number of *The Salmon and Trout Magazine*, which should not be missed by anyone who is interested in the problem of animal coloration. Without attempting to discuss or give any *résumé* of the paper, there is one point to which I should like to direct the attention of zoologists.

Most visitors to the Natural History Museum at South Kensington know of the ingenious device by which Dr. Thayer demonstrated his theory of the coloration of water birds. Two models representing ducks are so arranged and painted that one of them (A) is invisible until the observer comes close to the case; the other (B) is plainly to be seen from a considerable distance. A has been coloured dark above and light below, characteristic of most water birds, B the reverse. Hence it is suggested that the colours of aquatic birds are mainly protective against enemies on the shore, and to a certain extent against raptorial birds also. This theory has, I believe, met with much favour from ornithologists, even if they have not entirely accepted it.

Dr. Ward's results, however, seem to show that the coloration of flesh-eating aquatic birds is rather of an aggressive than of a protective nature, and that the light colour on the underside of such birds renders them invisible to their prey beneath the water. Certainly his photographs are distinctly striking, especially that of the heron and black-headed gull. It is much to be hoped that Dr. Ward will continue his observations "From the Fish's Point of View."

M. D. Hill.

Eton College, January 21.

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